REMARKS

In the preliminary amendment filed March 21, 2008, a grammatical error in the specification are corrected by this amendment. In addition, original claims 1-14 were canceled without any disclaimer of the subject matter, including Applicant's right to pursue any or all of original claims 1-14, and any claims to any other disclosed subject matter, by any subsequent or concurrent application claiming priority rights based on the instant application.

The application includes claim 15 which was added by amendment on March 21, 2008. An exemplary embodiment of new claim 15 is shown in Figures 2, 4 and 5 of the application and discussed on pages 4 to 16 of the application. New claim 15 combines some of the features of canceled claims 2-8 and particularly accounts for the start dates, classrooms and instructors with respect to available time windows, and considers back-to-back classes for each of these parameters. Claim 15 requires

analyzing operational revenue/profit under different planning scenarios involving chaining of various classes, prerequisite relationships, and inter-class spacing requirements;

generating a revenue/profit optimization model of overall operational revenue/profit under the different planning scenarios by location city;

solving a stochastic program of a revenue/profits optimization model by solving its deterministic equivalent; and

outputting a list of classes scheduled by curriculum identification (ID), corresponding start date, allocated classrooms, location city, allocated instructor, and expected revenue,

This is not akin to mere class scheduling.

Claim 15 provides antecedent basis for all features and avoids informalities identified by the Examiner in connection with cancelled claims 4 and 6-8.

Claims 1, 2, 7, 9, and 12-14 were rejected as being obvious over Parija "On Briding the Gap Between Stochastic Integer Programming and MIP Solver Technologies" 2002 in view of Sandhu "Automating Class Schedule Generation in the Context of a University Timetabling Information System" 2001. Claim 11

was rejected as being obvious over Parija in view of official notice (handling of multiple constraints simultaneously). Claims 3-6, 8, and 10 are rejected as being obvious over Parija/Sandhu in view of Johnson "A Database Approach to Course Timetabling" 1993. These rejections are moot in view of the prior amendment canceling the claims. In addition, claim 15 is unobvious over any combination of Parija, Sandhu, Johnson and official notice.

The invention is focused on a stochastic integer programming based constrained optimization method which allocates (1) classrooms and (2) instructors requested classes, where the method accounts for cancellation probabilities. The invention might, for example, be employed at a university; however, the invention has broader application to any organization which offers coursework to prospective students, and particularly considers <u>costs/benefits for courses offered in different cities</u> (see claim 15). Claim 15 addresses courses that are offered in different cities in different classrooms by different instructors, and requires

<u>inputting a list of classes by location city, preferred time window, their cancellation probabilities and available classrooms and instructors</u>.

Claim 15 is particularly concerned with revenues or profits which can be derived under multiple offering scenarios (e.g., if class x is offered at time y in a specified city, what will the profit be? If class x is offered at time y, and class a is offered at time b (right after time y or one hour after time y) in a specified city, will the profit for both offerings increase or decrease? If the same class x is offered in two cities which are close to one another on different days, will the profit for offering class x increase or decrease?). Claim 15 requires

<u>analyzing operational revenue/profit under different planning scenarios involving chaining of various classes, prerequisite relationships, and inter-class spacing requirements;</u>

<u>generating a revenue/profit optimization model of overall operational revenue/profit under the different planning scenarios by location city;</u>

<u>solving a stochastic program of a revenue/profits optimization model by solving its deterministic equivalent; and</u>

<u>outputting a list of classes scheduled by curriculum identification (ID), corresponding start date, allocated classrooms, location city, allocated instructor,</u>

and expected revenue

Claim 15 is particularly directed to handling classes which are scheduled back-to-back within the revenue/profit optimization model. That is, the method accounts for classroom space when courses are offered back-to-back; allocation of instructors when courses are offered back-to-back; allocation of time periods for each class; providing course offerings which require prior courses to be taken in advance (i.e., tier levels, see paragraph [0035]) etc., and it accounts for these constraints within the context of a revenue/profit optimization model. Claim 15 requires

wherein said start date for each class is calculated based on lengths of each class and available time windows for each class, and said start date for each back-to-back class is calculated based on lengths of each class and available time windows for each class,

wherein said allocated classrooms for each class is calculated based on tier codes for each class and available classrooms during allowable time windows for each class, and said allocated classrooms for each back-to-back class is calculated based on lengths of each class and available time windows for each class,

wherein said allocated instructors for each class is calculated based on available instructors with required skills during allowable time windows for each class, and said allocated instructors for each back-to-back class is calculated based on lengths of each class and available time windows for each class.

The methodology is presented in Figure 5 of the application and is discussed throughout the patent specification.

The reference to Parija, which was authored by one of the inventors of the present application, does not address time tabling applications, as is acknowledged in the office action. Thus, Parija also does not show or suggest

analyzing operational revenue/profit under different planning scenarios involving chaining of various classes, prerequisite relationships, and inter-class spacing requirements;

generating a revenue/profit optimization model of overall operational revenue/profit under the different planning scenarios by location city;

solving a stochastic program of a revenue/profits optimization model by solving its deterministic equivalent; and

outputting a list of classes scheduled by curriculum identification (ID), corresponding start date, allocated classrooms, location city, allocated instructor, and expected revenue

Parija specifically notes that stochastic integer programming problems arise in scheduling, finance, and other settings (see lines 6 and 11 on page 2), but Parija does not provide any discussion of applying stochastic problem solving for a combination of course scheduling that addresses back-to-back scheduling, different tier courses, offering of courses in different cities, etc. and revenue/profit optimization. Page 4 of Parija, referenced in the office action, discusses problem formulation, solving for LP relaxation, and searching the Branch-And-Bound Tree in general. Page 4 of Parija does not discuss solving scheduling and finance issues, which are acknowledged on page 2 to be difficult. Page 5 discusses planning for the production of different item sizes under demand uncertainty—pages 7-9 discuss various improvements to the size problem. Pages 10 et seq. discusses how one would determine the capacity expansion schedule of multiple facilities under fixed charged expansion costs, and cost and demand uncertainty. Pages 12 et seq. discusses a scheduling the purchase of semiconductor fabrication tools and the allocation of tool capacity to meet demand. Page 16 discusses stochastic dynamic capacity acquisition and assignment problems.

Sandhu describes processes for automating class schedules in the context of a university timetabling information system (see Title). As noted by the Examiner, Sandhu describes considering student preferences for classes and analyzes for potential clashes between classes. Figures 6-17 on pages 96-103 of Sandhu shows a variety of considerations focused respectively on the subject, student, rooms, subject class timetables, departments, courses, titles, teaching contract types, faculty, campuses and buildings, room availabilities, and teaching position. Page 84 of Sandhu, referenced in the office action, discusses scheduling that minimizes clashes of subjects—i.e., making sure that students are not assigned two or more subjects at the same time on the same day. The "weighting" discussed refers to the use of enrollment data where clashes between subjects is given a higher weight than clashes between tutorials. Sandhu does not show

generating a revenue/profit optimization model of overall operational

revenue/profit under the different planning scenarios by location city;

or

outputting a list of classes scheduled by curriculum identification (ID), corresponding start date, allocated classrooms, location city, allocated instructor, <u>and expected revenue</u> (emphasis added).

Absent from both Parija and Sandhu is

generating a revenue/profit optimization model of overall operational revenue/profit under the different planning scenarios by location city

The Office Action references page 19 of Sandhu as shows "maximising profits"; however, with reference to page 19 of Sandhu it can be seen that this passage pertains to the use of Linear Programming in general (note that a reference to another article is cited), and Sandhu does not utilize LP to look at revenue/profit in combination with time tabling. The Office Action also references pages 3 and 4 of Parija which discus using an MIP solver in solving LP relaxations. However, like Sandhu, Parija does not look at revenue/profit in combination with time tabling. Further, no combination of Sandhu and Parija makes obvious the process which considers revenue/profit in the context of back–to-back class scheduling.

Johnson describes a database approach to course timetabling (see title). Unlike the present invention, Johnson is much like Sandhu and does not consider revenue/profit optimization. The Johnson article reviews how time tabling has been handled previously by clerical staff, and notes that the use of database and a computer greatly simplifies timetabling. The principle concern in timetabling according to Johns is to make sure the teachers and students are not double booked for any particular time slot (see page 432). Page 428 shows that Johnson identifies common constraints such as room allocations, teaching requirements, staff workloads, and facilities utilization. At no point does Johnson address profit maximization. Further, Johnson does not take into account offerings being made in different cities. In addition, Johnson does not address the impact of back-to-back offerings on scheduling courses in a way which assures availability of teachers and facilities, and which considers profit maximization.

The official notice on page 15 shows that it is well known to simultaneously handle multiple constraints in the math programming arts (see page 14). This is agreed as the Parija and Sandhu references show handling of

multiple constraints. However, it should also be recognized that traditional math programming arts do not make all inventions that utilize math programming obvious. The prior art cited in the office action show

a) Many people have worked for a very long time at handling a myriad of issues related to timetabling in a university setting (Sandhu and Johnson)(although it is not conceded that Sandhu and Johnson address all of the time tabling problems addressed by the present invention—they do not address the back-to-back and tier considerations which are addressed in the present methodology); and

b) Stochastic Integer Programming can be used to solve a number of problems (Parija) (examples include planning for the production of different item sizes under demand, determining the capacity expansion schedule of multiple facilities under fixed charged expansion costs, and cost and demand uncertainty, scheduling the purchase of semiconductor fabrication tools and the allocation of tool capacity to meet demand, and the stochastic dynamic capacity acquisition and assignment problems)

Claim 15 recites a stochastic integer programming based constrained optimization method that is unique from Parija, Sandhu, Johnson and issues related to Official Notice. The method handles a variety of class scheduling matters, some of which are not addressed in Sandhu and Johnson (back-to-back scheduling, classes of different time lengths, consideration of tier cods, application in different cities, and availability of qualified instructors), and prepares a revenue/profit optimization model for different planning scenarios in different location cities, and outputs a list of classes scheduled by curriculum identification (ID), corresponding start date, allocated classrooms, location city, allocated instructor, and expected revenue,

In view of the foregoing, Applicants submit that Claim 15 is in condition for allowance. The Examiner is respectfully requested to pass the above application to issue. The Examiner is invited to contact the undersigned at the telephone number listed below, if needed.

Applicants hereby make a written conditional petition for extension of time, if required. Please charge any deficiencies in fees and credit any overpayment of fees to Applicants' Deposit Account No. 50-0510 (IBM Corporation).

Respectfully submitted,

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